

What is claimed is:

1. A system for preventing the introduction of air into a patient during the insertion of a medical device into the vasculature thereof, the system comprising:

5 a flexible sheath formed with a lumen and positioned in the vasculature of the patient to expose an extracorporeal end thereof;

10 an air trap chamber having an insertion opening, an exit opening and a gas removal port, with the exit opening being engageable with the extracorporeal end of said sheath to establish a pathway for advancement of the device sequentially through the insertion opening, through the air trap chamber, through the lumen of said sheath, and into the vasculature; and

15 a means for removing air from said chamber through the gas removal port during an advancement of the device through said system.

2. A system as recited in claim 1 further comprising:

20 a proximal hemostasis valve disposed over the insertion opening of said air trap chamber; and

a distal hemostasis valve disposed over the device exit opening of said air trap chamber.

3. A system as recited in claim 1 wherein said gas removing means is a syringe.

4. A system as recited in claim 1 wherein said gas removing means comprises:

a gas separator connected in fluid communication with the air trap chamber through a return tube; and

5 a fluid pump connected in fluid communication between the gas removal port of said air trap chamber and said gas separator, for pumping fluid from said air trap chamber through said gas separator to remove gas from said fluid before returning the fluid through the return tube to said air trap chamber.

10 5. A system as recited in claim 4 wherein said fluid pump is a peristaltic pump.

6. A system as recited in claim 1 wherein said air trap chamber has a second gas removal port for venting gas from said air trap chamber as said air trap chamber is filled with a fluid.

15 7. A system as recited in claim 1 further comprising an adapter for connecting said sheath to the exit opening of said air trap chamber.

8. A system as recited in claim 1 wherein said air trap chamber has a top portion shaped to trap and direct gas bubbles toward the gas removal port.

9. A sheath to facilitate insertion of a medical device into a blood vessel, comprising:

a tubular body having a distal portion adapted to be inserted into a blood vessel;

an air trap chamber fluidly connected to a proximal portion of the tubular body;

10 a distal hemostasis valve separating the tubular body from the air trap chamber; and

a proximal hemostasis valve disposed at an opening of the air trap chamber for insertion of the device therethrough.

10. The sheath as recited in claim 9, wherein a longitudinal axis of 15 the proximal hemostasis valve is aligned with a longitudinal axis of the distal hemostasis valve.

11. The sheath as recited in claim 9, further comprising a gas removal port formed through a surface of the air trap chamber.

12. The sheath as recited in claim 9, further comprising a gas 20 separator chamber in fluid communication with the air trap chamber.

13. The sheath as recited in claim 12, further comprising a pump for circulating fluid between the air trap chamber and the gas separator chamber.

14. The sheath as recited in claim 9, wherein the air trap chamber has a portion shaped to direct gas bubbles to a collection portion of the air trap chamber.

15. A method for preventing the introduction of air into a patient 5 during the insertion of a medical device into the vasculature thereof, the method comprising the steps of:

providing a flexible sheath formed with a lumen, the sheath being engageable with an air trap chamber having an insertion opening, an exit opening and a gas removal port,

10 positioning the sheath in the vasculature of a patient to expose an extracorporeal end thereof;

engaging the extracorporeal end of the sheath with the exit opening of the air trap chamber to establish a pathway for advancement of the medical device along a pathway sequentially 15 through the insertion opening, through the air trap chamber, through the lumen of the sheath, and into the vasculature of the patient; and

removing air from said chamber through the gas removal port during an advancement of the device through the system.

16. A method as recited in claim 15 wherein said air removing step 20 is accomplished using a syringe.

17. A method as recited in claim 15 wherein said air removing step is accomplished using a pumping system which comprises:

25 a gas separator connected in fluid communication with the air trap chamber through a return tube; and

a fluid pump connected in fluid communication between the gas removal port of said air trap chamber and said gas separator, for pumping fluid from said air trap chamber through said gas separator to remove gas from said fluid before returning the fluid through the return tube to said air trap chamber.

18. A method as recited in claim 17 wherein said fluid pump is a peristaltic pump.

19. A method as recited in claim 15 wherein said air trap chamber has a second gas removal port for venting gas from said air trap chamber as
5 said air trap chamber is filled with a fluid.

20. A method as recited in claim 15 further comprising the step of forming said air trap chamber with a top portion shaped to trap and direct gas bubbles toward the gas removal port.